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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/084,873	03/01/2002	Quinn K. Tong	1987.EEM	7243

7590 11/10/2005

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EXAMINER

ZARNEKE, DAVID A

ART UNIT PAPER NUMBER

2891

DATE MAILED: 11/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/084,873

Applicant(s)

TONG ET AL.

Examiner

David A. Zameke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-22 and 24-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-22 and 24-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                        |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments filed 7/15/05 have been fully considered but they are not persuasive.

It is argued that it would not have been obvious to one of ordinary skill in the art to optimize the solidification and cure temperatures of the encapsulant because the required catalyst must have a cure temperature greater than 180°C to allow the solder to form a proper interconnection.

The examiner asserts that a skilled artisan would determine this through routine experimentation. The failure to form a proper solder bond would come up through routine experimentation and adjustments would be made until a satisfactory result was achieved.

Further, the claims do not require solder to be used. Other materials could be used such as metal posts or metal filled polymers. These materials would form a proper bond at different temperatures.

Also argued is that the B-stage temperature is intimately tied to the final cure temperature because it must be at least 30°C below the final cure temperature.

Again, seeing as no criticality was claimed in the specification, a skilled artisan would determine this through routine experimentation. One would experiment with the temperature until the best possible result was achieved. The skilled artisan knows that

the B-stage and the final cure temperatures are intimately tied together. Which is why they would experiment with this relationship to achieve the desired result.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al., US Patent 6,194,788, in view of Kunitomo, JP 58103525.

Gilleo teaches a B-stage-able underfill encapsulant (7, 54+) comprising:

- a) thermal curable resin system comprising an admixture of at least one epoxy, one preferably being biphenyl A (4, 7+);
- b) a hardener such as acid anhydrides (4, 12+);
- c) at least one solvent (4, 40+);
- d) at least one inorganic filler (4, 23+); and
- e) at least one fluxing agent (4, 18+),

wherein the encapsulant solidifies during the B-stage process to produce a smooth, non-tacky surface on a semiconductor wafer (4, 3+) or silicon chip.

The B-stage encapsulant of Gilleo inherently produces a smooth, non-tacky surface because Applicant's own specification states that B-stage means that the

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underfill must be solidified after its placement on a wafer to provide a smooth, non-tacky coating (page 3, last line and page 4, top).

Gilleo fails to teach the use of an imidazole-anhydride adduct as the hardener.

Kunitomo teaches an epoxy resin composition (abstract) comprising an epoxy resin; a phenol containing compound, namely a phenol novolak resin; a 2-methylimidazole/pyromellitic anhydride complex curing agent; and an inorganic filler (page 233, 2<sup>nd</sup> column, 4<sup>th</sup> to last line).

It would have been obvious to one of ordinary skill in the art to use the curing promoting agent of Kunitomo in the invention of Gilleo because Kunitomo teaches that the anhydride-imidazole complex provides long-term storage stability.

Gilleo and Kunitomo fail to teach the temperature range at which the encapsulant solidifies nor the temperature range at which the encapsulant finally cures.

Barring a showing of unexpected results, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the solidification and final cure temperatures through routine experimentation (MPEP 2144.05).

Claims 3-22 and 24-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al., US Patent 6,194,788, in view of Kunitomo, JP 58103525 as applied to claim 1 above, and further in view of Kobayashi et al., JP 62-081416A.

Kobayashi teaches an epoxy composition for sealing a semiconductor comprising an epoxy resin, a phenol type curing agent and a curing promoting agent.

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It would have been obvious to one of ordinary skill in the art to use the composition of Kobayashi in the invention of Gilleo and Kunitomo because Kobayashi is relied upon to teach the conventionality of the components.

The use of conventional materials to perform their known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Regarding claim 3, Kobayashi teaches an epoxy and a phenol, wherein the epoxy can comprise an aliphatic epoxy (3, 4<sup>th</sup> to last paragraph).

With respect to claim 4, Kobayashi teaches an epoxy novolak resin (3, 4<sup>th</sup> to last paragraph).

As to claims 5 and 6, Gilleo teaches the use of bisphenol A (4, 7+).

Regarding claims 7-11, it would have been obvious to one of ordinary skill in the art to optimize the percentage of epoxy and phenol in the epoxy/phenol admixture, and the percentage of the admixture in the whole encapsulant (MPEP 2144.05(b)).

With respect to claim 12, Kobayashi teaches the use of a triphenylphosphine and it would have been obvious to one of ordinary skill in the art to optimize the anhydride used (MPEP 2144.05(b)).

As to claim 13, it would have been obvious to one of ordinary skill in the art to optimize the imidazole-anhydride adduct used (MPEP 2144.05(b)).

Regarding claims 14 and 15, it would have been obvious to one of ordinary skill in the art to optimize the percentage of the imidazole-anhydride adduct in the encapsulant (MPEP 2144.05(b)).

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With respect to claims 16-18, considering Gilleo teaches the use solvents or solvent blends that are comparable to the components selected (4, 40+), it would have been obvious to one of ordinary skill in the art to optimize the solvent selected (MPEP 2144.05(b)).

As to claim 19, it would have been obvious to one of ordinary skill in the art to optimize the percentage of solvent in the encapsulant (MPEP 2144.05(b)).

Regarding claims 20 and 21, Gilleo teaches the use of silica filler (8, 12).

With respect to claim 22, it would have been obvious to one of ordinary skill in the art to optimize the percentage of filler in the encapsulant (MPEP 2144.05(b)).

Regarding claims 24 and 25, it would have been obvious to one of ordinary skill in the art to optimize the flux used (MPEP 2144.05(b)).

With respect to claims 26 and 27, it would have been obvious to one of ordinary skill in the art to optimize the percentage of flux in the encapsulant (MPEP 2144.05(b)).

As to claim 28, Gilleo teaches the use of wetting agents, cross-linking agents and polymerization catalysts (4, 18+).

Regarding claims 29 and 30, it would have been obvious to one of ordinary skill in the art to optimize the surfactant and diluent used (MPEP 2144.05(b)).

With respect to claim 31, the B-stage processing of the encapsulant before dicing the wafer into chips is conventionally known in the art.

The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

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Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al., US Patent 6,194,788, in view of Kunitomo, JP 58103525.

Gilleo teaches a wafer having B-stageable underfill composition deposited on one face of the wafer, the B-stageable composition comprising:

- a) thermal curable resin system comprising an admixture of at least one epoxy, one preferably being biphenyl A (4, 7+);
- b) a hardener such as acid anhydrides (4, 12+);
- c) at least one solvent (4, 40+);
- d) at least one inorganic filler (4, 23+); and
- e) at least one fluxing agent (4, 18+).

Gilleo fails to teach the use of an imidazole-anhydride adduct.

Kunitomo teaches an epoxy resin composition (abstract) comprising an epoxy resin; a phenol containing compound, namely a phenol novolak resin; a 2-methylimidazole/pyromellitic anhydride complex curing agent; and an inorganic filler (page 233, 2<sup>nd</sup> column, 4<sup>th</sup> to last line).

It would have been obvious to one of ordinary skill in the art to use the curing promoting agent of Kunitomo in the invention of Gilleo because Kunitomo teaches that the anhydride-imidazole complex provides long-term storage stability.

Gilleo and Kunitomo fails to teach the temperature range at which the encapsulant solidifies nor the temperature range at which the encapsulant finally cures.

Barring a showing of unexpected results, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the solidification and final cure temperatures through routine experimentation (MPEP 2144.05).

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

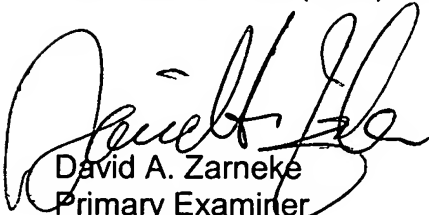
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "David A. Zarneke", is written over the printed name and title.

David A. Zarneke  
Primary Examiner  
November 1, 2005